
Using Geographic Information Systems (GIS) to Achieve Integrated Range Management

**Sustainable Ranges Panel
Army Worldwide Environment & Energy Workshop
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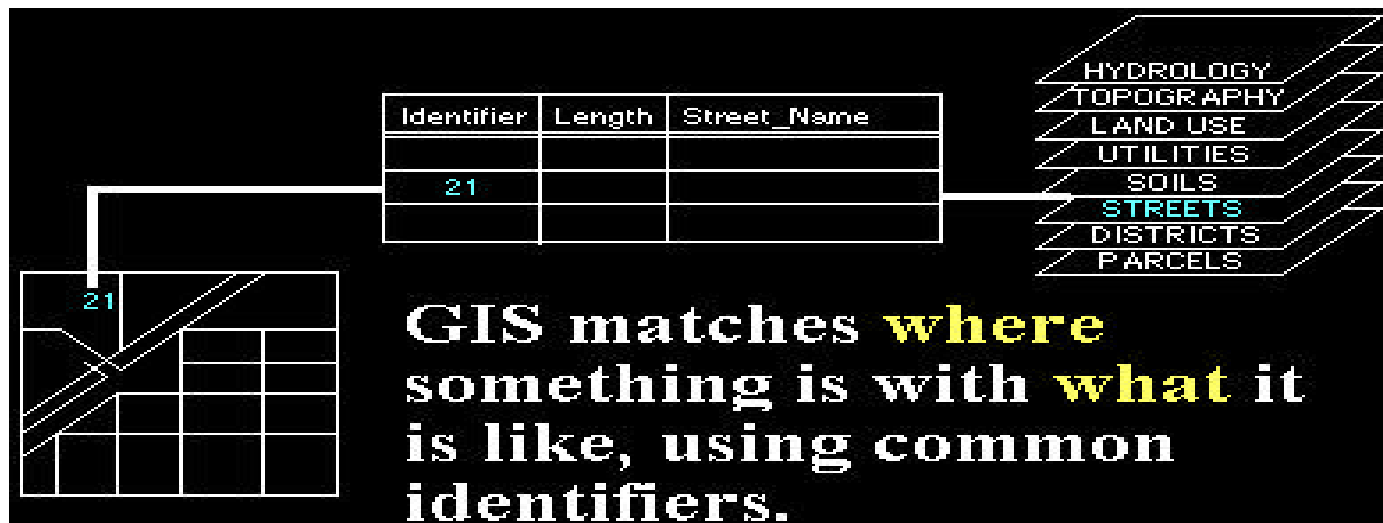
Agenda

- **What is a GIS?**
- **Current Army GIS Uses**
- **Potential Army GIS Uses**
- **The Way Ahead**

What is GIS?

"Spreadsheet of the 21st Century"

- GIS is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information visually, i.e. data identified according to location.
- Tool for mapping and analyzing things that exist and events that happen on earth
- Integrates database operations such as query and statistical analysis with the visualization and geographic analysis benefits offered by maps

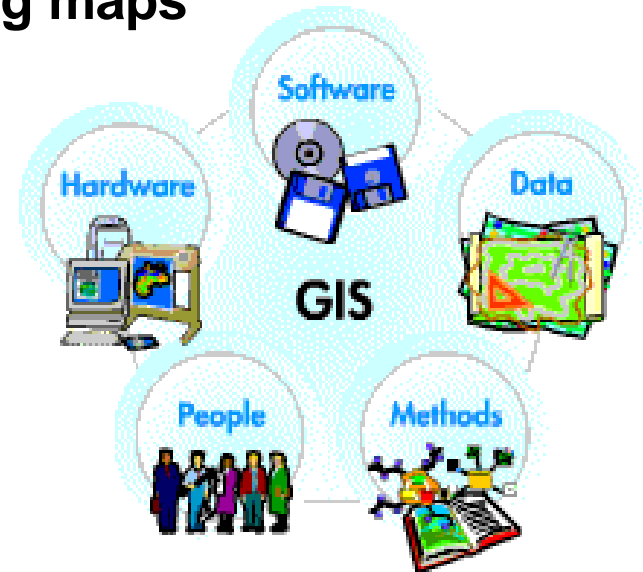


What is GIS?

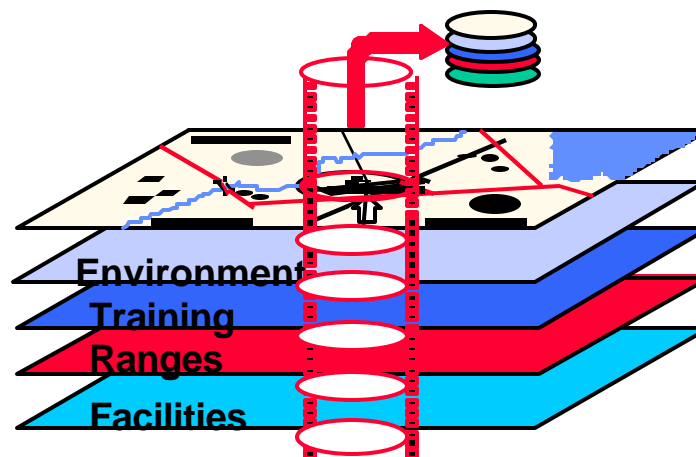
GIS is not simply a computer system for making maps

Questions a GIS can answer

- **Location:** What is at a given location?
- **Condition:** Where does something occur?
- **Trends:** What has changed since...?
- **Patterns:** What spatial patterns exist?
- **Modeling:** What if...?



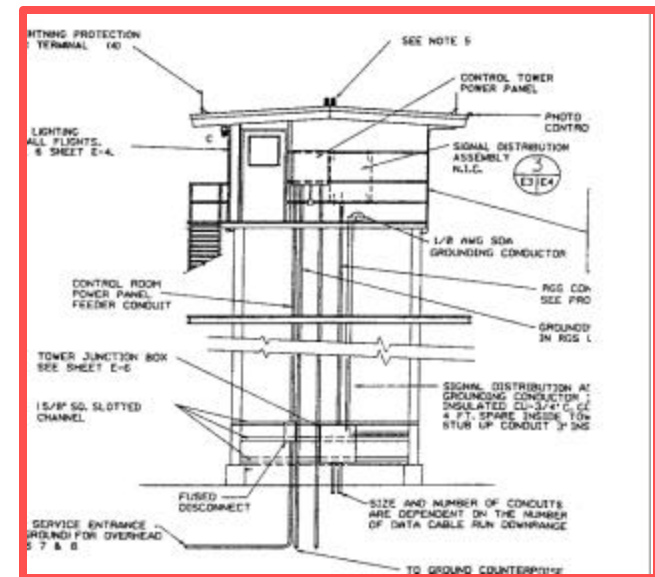
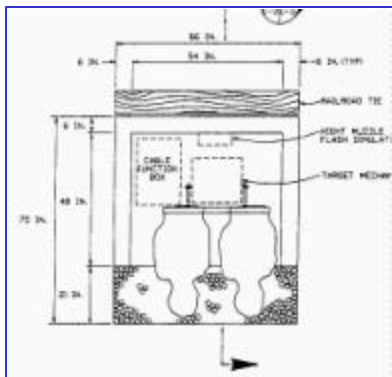
Provides capability for integrating data and events spatially and visually



Current Army GIS Uses

Facility and Real Property Managers

- Often Use Computer Aided Design and Drafting (CADD) Systems
 - Essentially scanned blueprints with measuring tools
 - Are not always tied to the earth
 - Generally don't have DBMS or support robust analysis
- Focus on Infrastructure, Utilities, Buildings, Roads, Property Boundaries



Current Army GIS Uses

Environmental Managers

- Normally the most robust GIS on an installation
 - Significant investments made
 - Often independent from other installation CADD or GIS
 - Compliance with Standards and Metadata hit and miss
- Focus on Natural Resources, Endangered Species, Wetlands, Forestry, Planning level surveys, Cultural resources

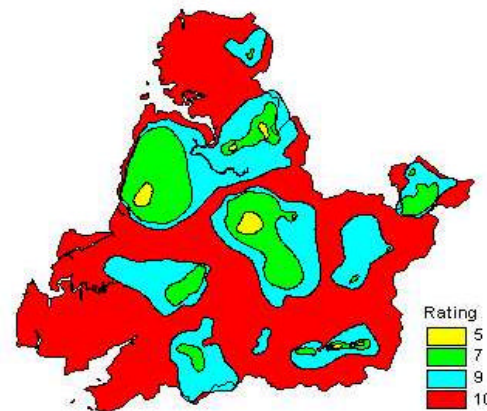
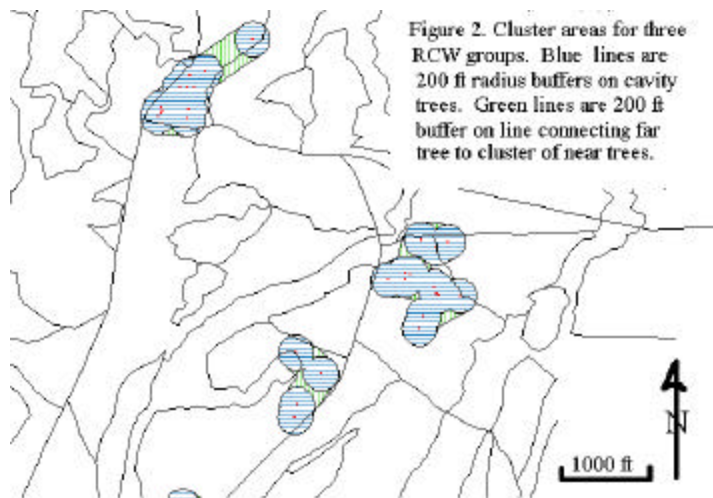


Fig. 2 Depth to water

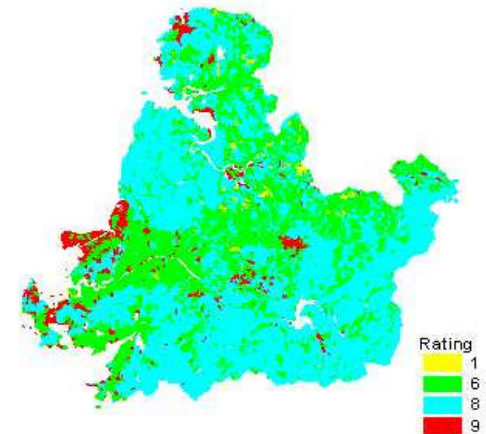
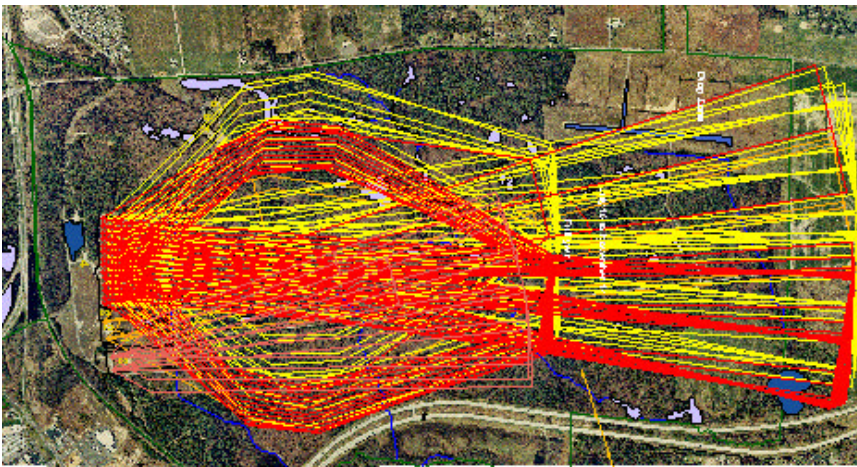


Fig. 3 Net recharge

Current Army GIS Uses

Range Operations

- Range scheduling, tracking automation not standardized
 - Several versions of RFMSS currently fielded
 - Some installations not using RFMSS
 - RFMSS data not linked to GIS
- Range safety fans, Surface Danger Zones, usually calculated by hand and posted by grease pencil on mylar overlays.



Ammunitions Picklist
Select an Ammo When Editing or Deleting

DODIC	Alias
4010	120A DLR
4011	120A DBK
4014	120A 7.5
4017	120A 9
4029	5.56M M855
4090	5.56M M1K
4062	5.56M M42
4083	5.56M M438
4054	5.56M M7
4068	5.56M M196
4071	5.56M M193
4072	5.56M TR
4075	5.56M M3A1
4090	5.56M M300
4096	22LR
4090	22 CAL
4091	22LR MATCH
4093	22LR
6107	7.62M M308
A111	7.62M M82

Ammunitions Data

DODIC: **A111** Alias: **7.62MBLM82**

Long Description
CTG 7.62MM BLANK LINKED M82

Live Fire? ☐ Yes ☒ No

Maximum Trajectory:

☐ Installation Specific

Add Edit Delete Save

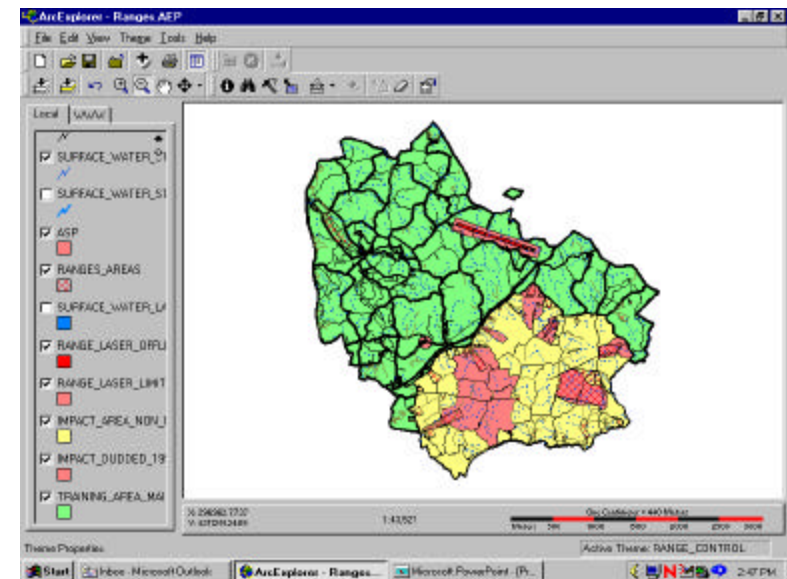
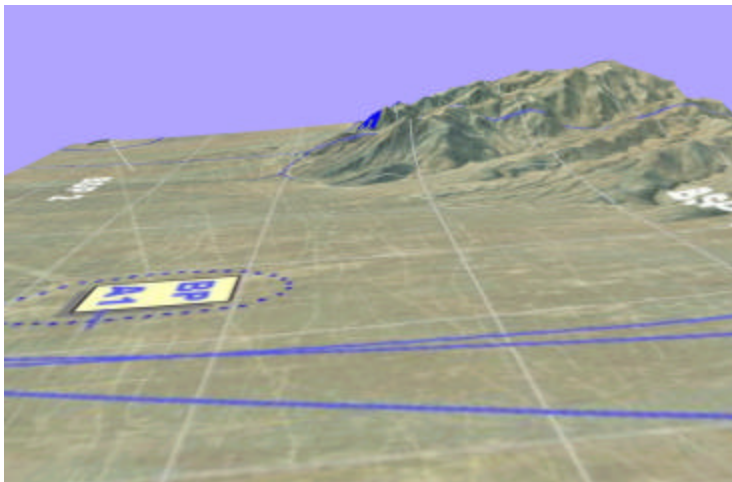
Save Undo

Current Army GIS Uses

Integrated Training Area Management

ITAM GIS

- Much of program centrally managed through Regional Support Centers
- Standards and Meta data emphasis
- Focus on using existing data to support training and provide integrated land management solutions.



Current Army GIS Issues

Software/Hardware

- Multiple non-connected Systems

Data

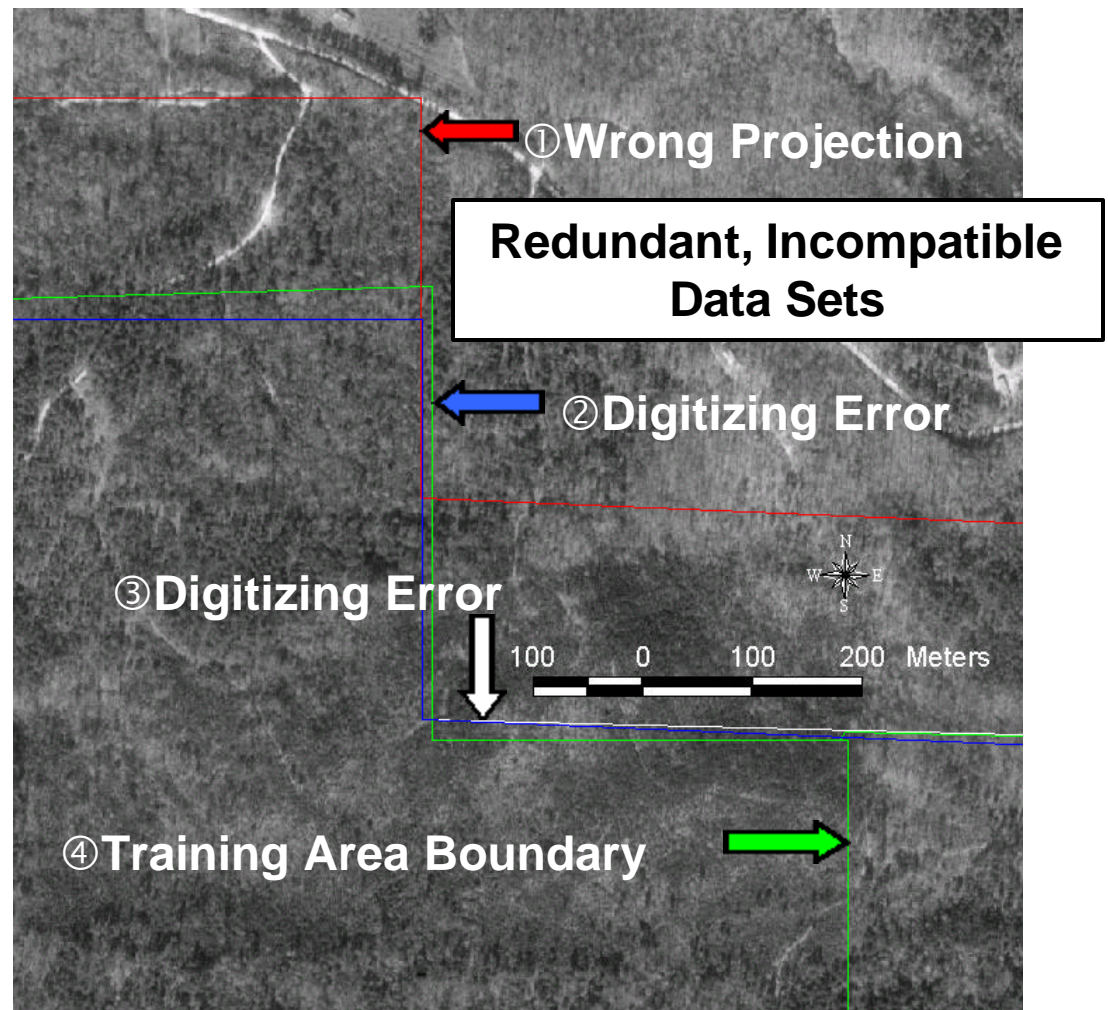
- Redundant data sets
- Varying Standards
- Increased Acquisition Cost

People

- Increased Requirements
- Varied Skill Sets

Methods

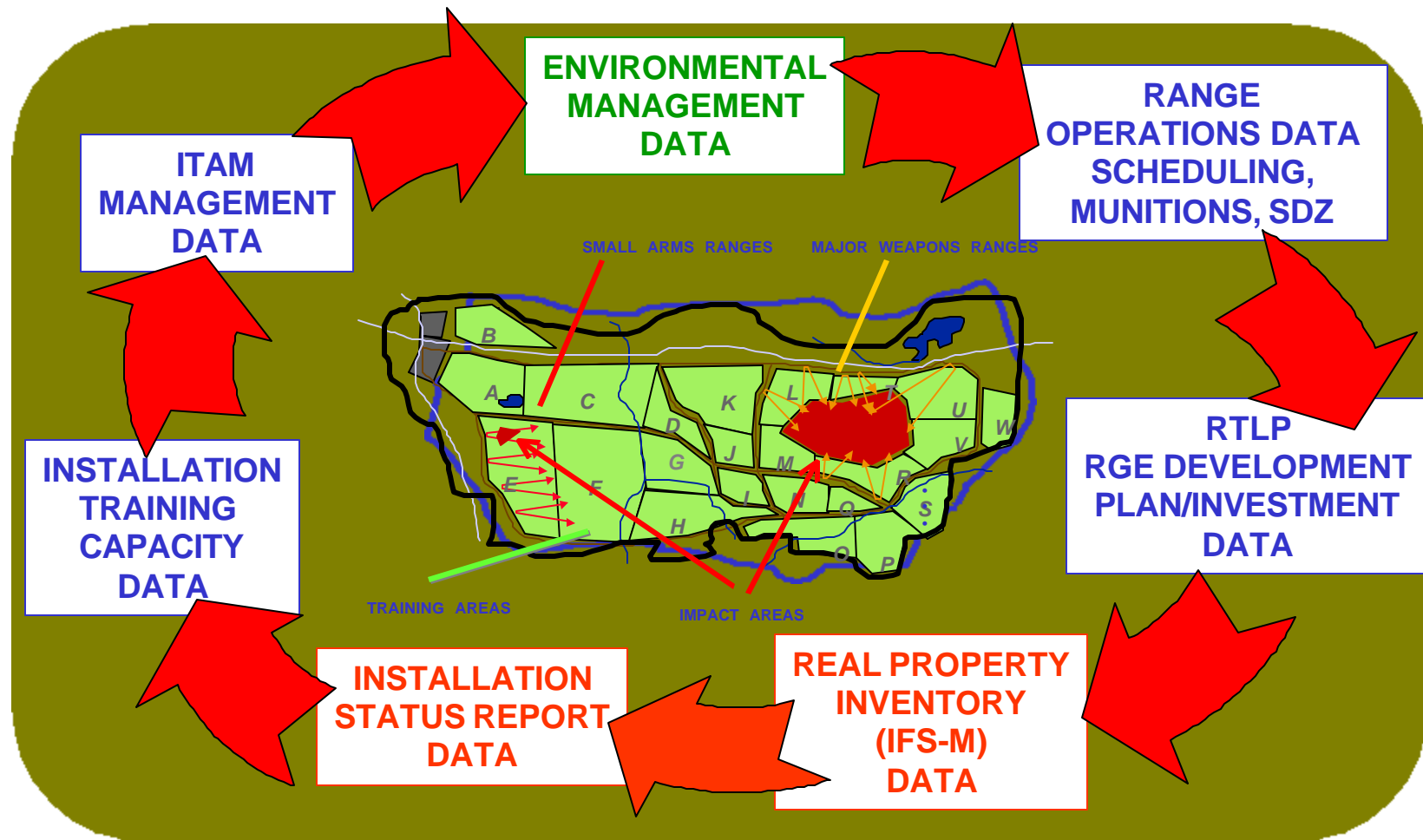
- Centralized Decision Support Lacking



Potential Army GIS Uses

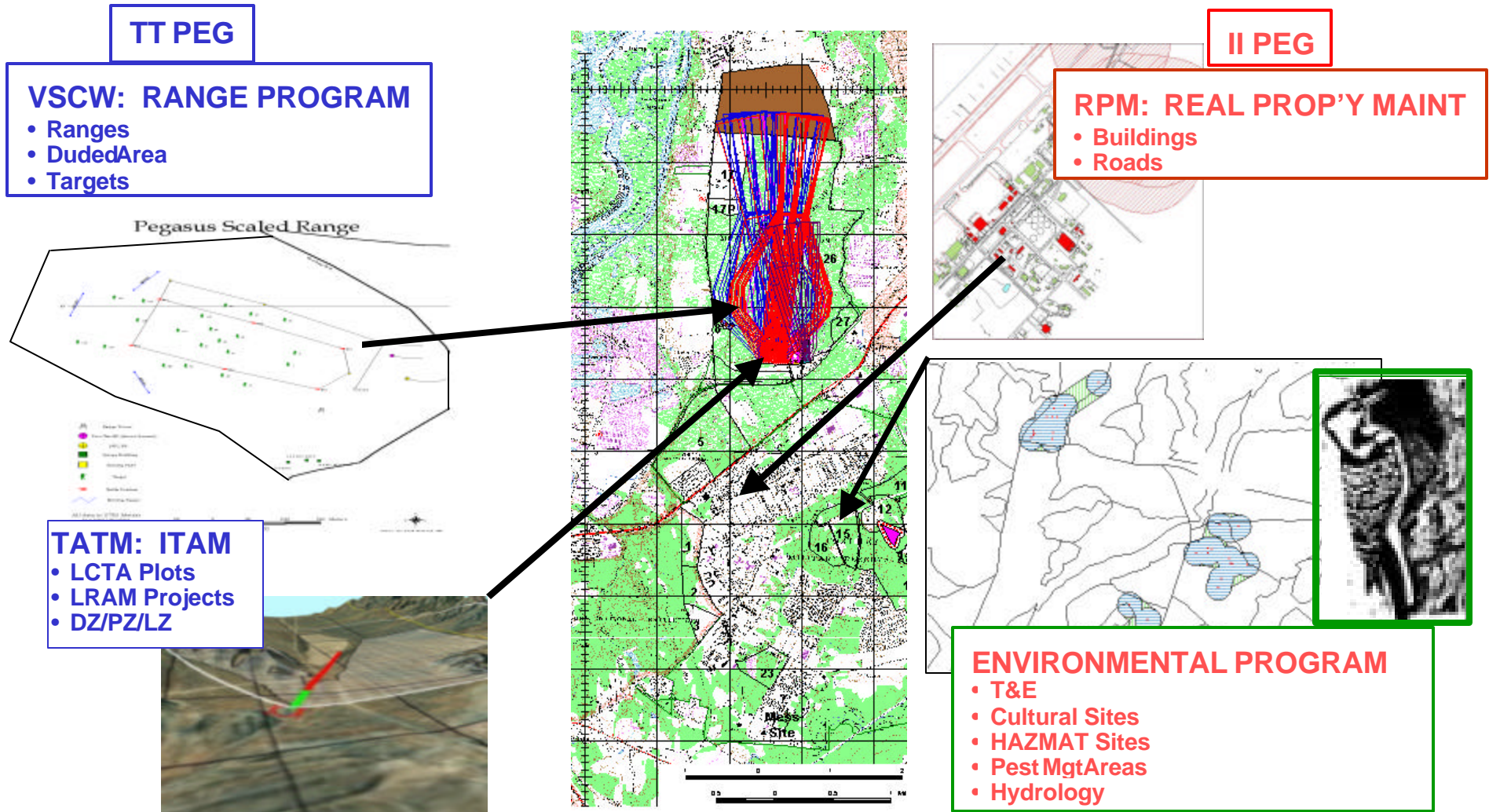
Corporate Data

Supporting Consistent Management and Decision Making



Potential Army GIS Uses

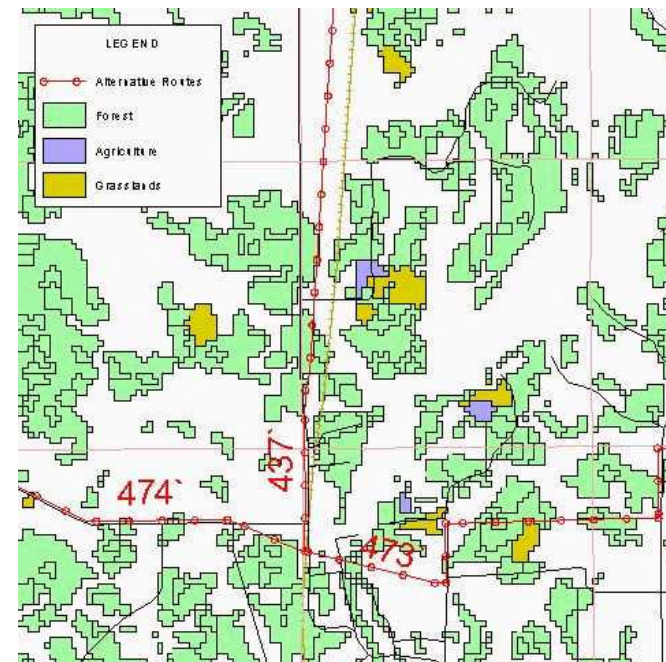
GIS as the Tool Providing a Common View



Potential Army GIS Uses

Modeling and Simulation

- Installation enterprise GIS with a corporate relational database core
 - Used to support integrated planning
 - Used to monitor infrastructure, environmental, range conditions
 - Used to predict impacts of events and actions
 - Used to support integrated decision making



The Way Ahead

INFORMATION DOMINANCE

- **Having the best “Information” is key to sustainable range management.**
- **Geographic Information System (GIS) spatial data is among the most effective information management tools we have.**

The Way Ahead

- **Proponency**
 - **Integrate efforts and resources - ARSIC**
 - **Established proponency for core data requirements**
- **Policy**
 - **Standards**
 - **Establish policy requiring corporate installation GIS**
 - **Formulate funding guidance - who can buy**
- **Leverage current integrating programs and projects**
 - **ITAM GIS**
 - **LMS**

GIS Capabilities Scenario

Mr. John Phillips

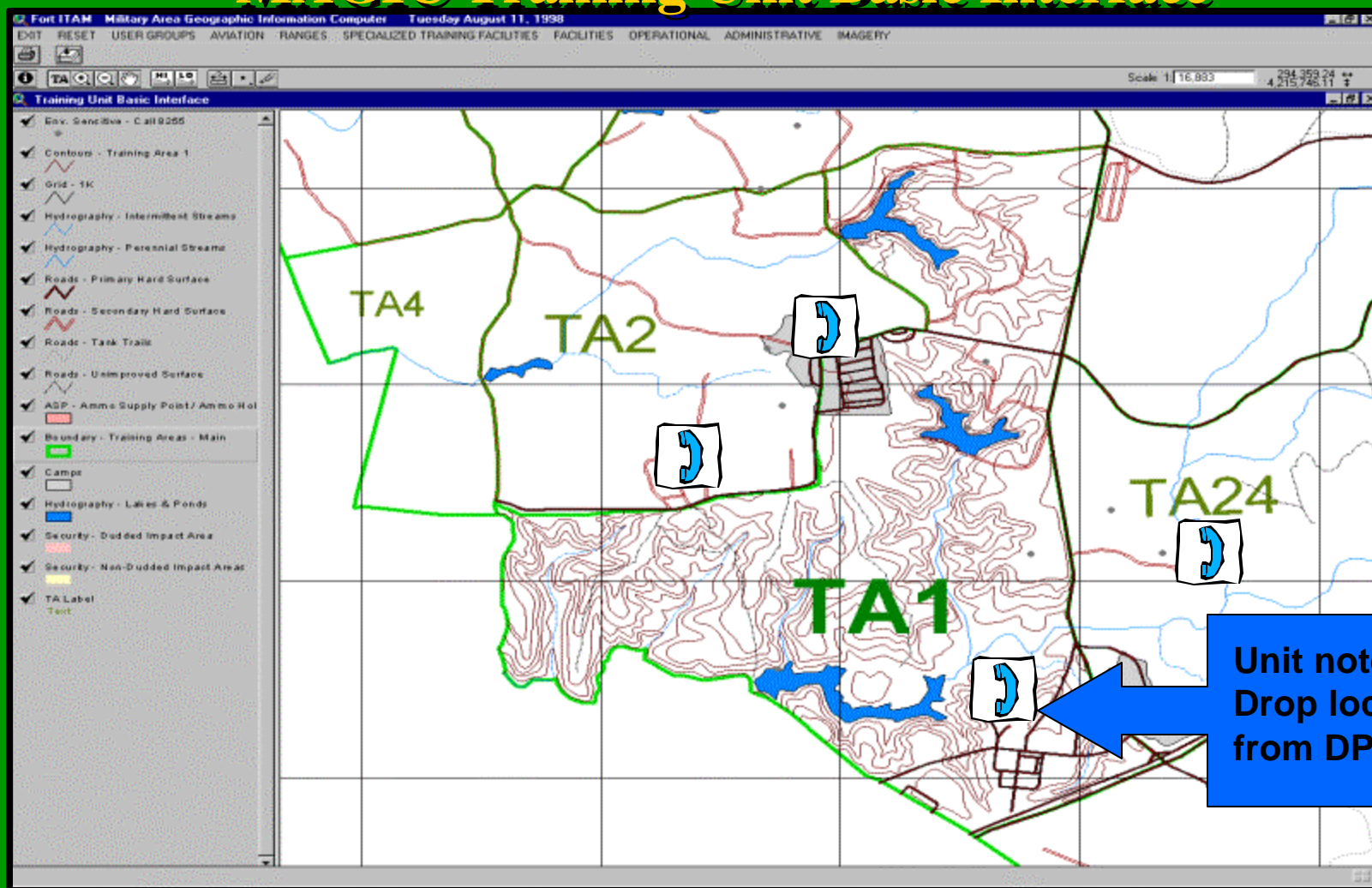
GIS Capabilities Scenario

Unit conducts tactical reconnaissance

- **Using MAGIC Training Unit Basic or Training Unit Advanced interfaces to facilitate tactical decision making**

GIS Capabilities Scenario

Unit conducts tactical reconnaissance with MAGIC Training Unit Basic Interface



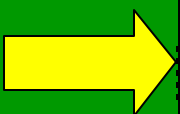
GIS Capabilities Scenario

Unit conducts scheduling reconnaissance

- **RFMSS tracks MIMs**
- **MAGIC displays projected MIMs
(current + scheduled)**

GIS Capabilities Scenario

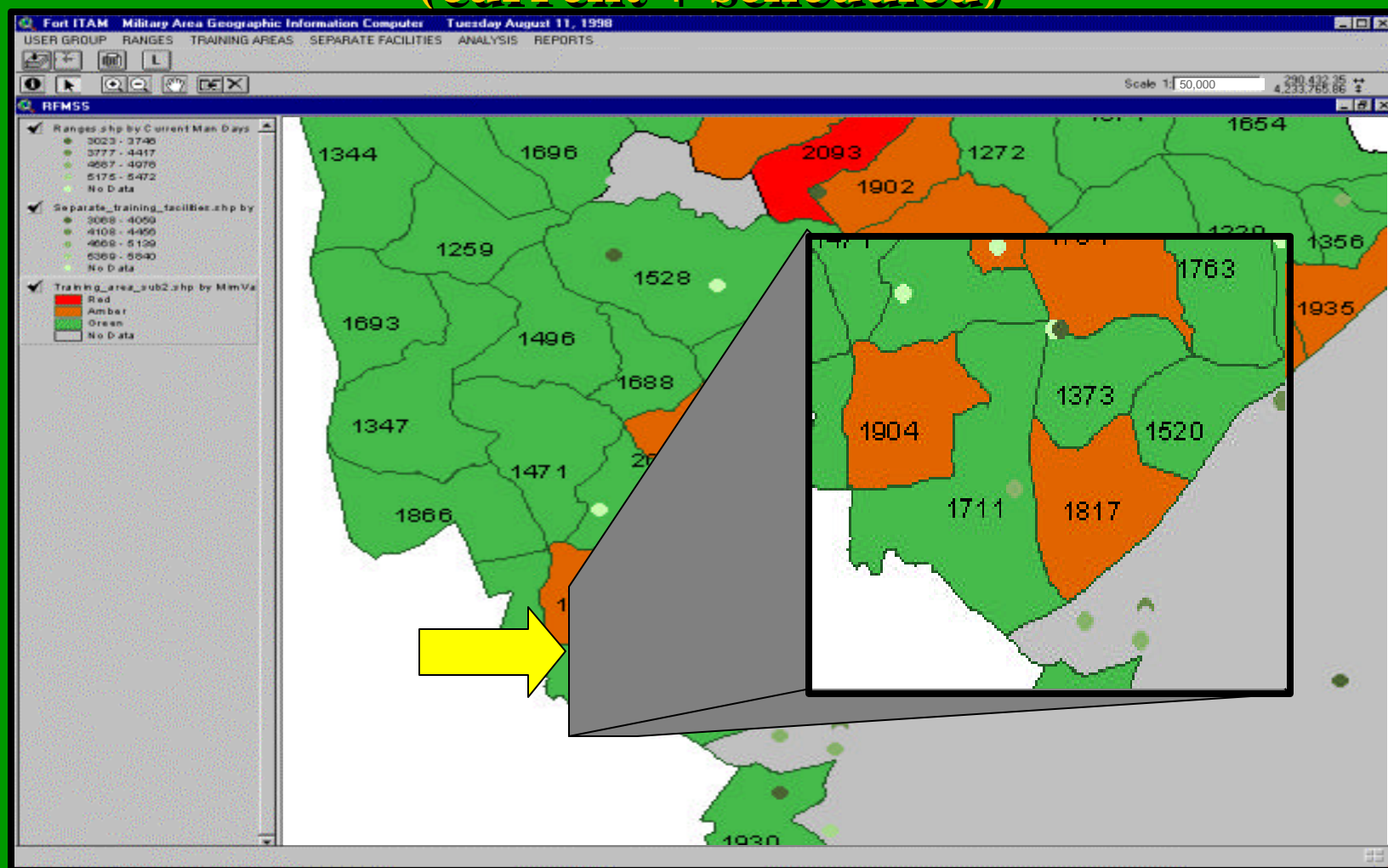
RFMSS tracks MIMs



<i>Tra_area</i>	<i>Redmin</i>	<i>Greenmin</i>	<i>Tgtmin</i>	<i>Cummin</i>	<i>Frzmin</i>
RODES	0	0	0	0	0
SCOUT LN	0	0	0	0	0
TA 21D	0	0	0	0	0
TA1	1850	1750	1800	972	1711
TA10	0	0	0	0	0
TA10A	0	0	0	0	0
TA10B	0	0	0	0	0
TA10C	0	0	0	0	0
TA11	0	0	0	0	0
TA11A	0	0	0	0	0
TA11B	0	0	0	0	0
TA12	0	0	0	0	0
TA12A	0	0	0	0	0
TA12B	0	0	0	0	0
TA12C	0	0	0	0	0
TA13	0	0	0	0	0
TA13A	0	0	0	0	0
TA13B	0	0	0	0	0

GIS Capabilities Scenario

MAGIC MIMs status display (current + scheduled)



GIS Capabilities Scenario

Unit schedules training area

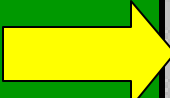
- In RFMSS, unit selects Training Area (TA1), Date (25/08/1998), Training Event (100 MIMs)
- RFMSS recalculates MIMs (+ 100 MIMs for TA1)
- MAGIC MIMs displays (current + scheduled + 100 for TA1)

**In RFMSS, unit selects Training Area (TA1),
Date (25/08/1998), Training Event (100 MIMs)**

USAEC - Supporting Integrated Range Sustainment

GIS Capabilities Scenario

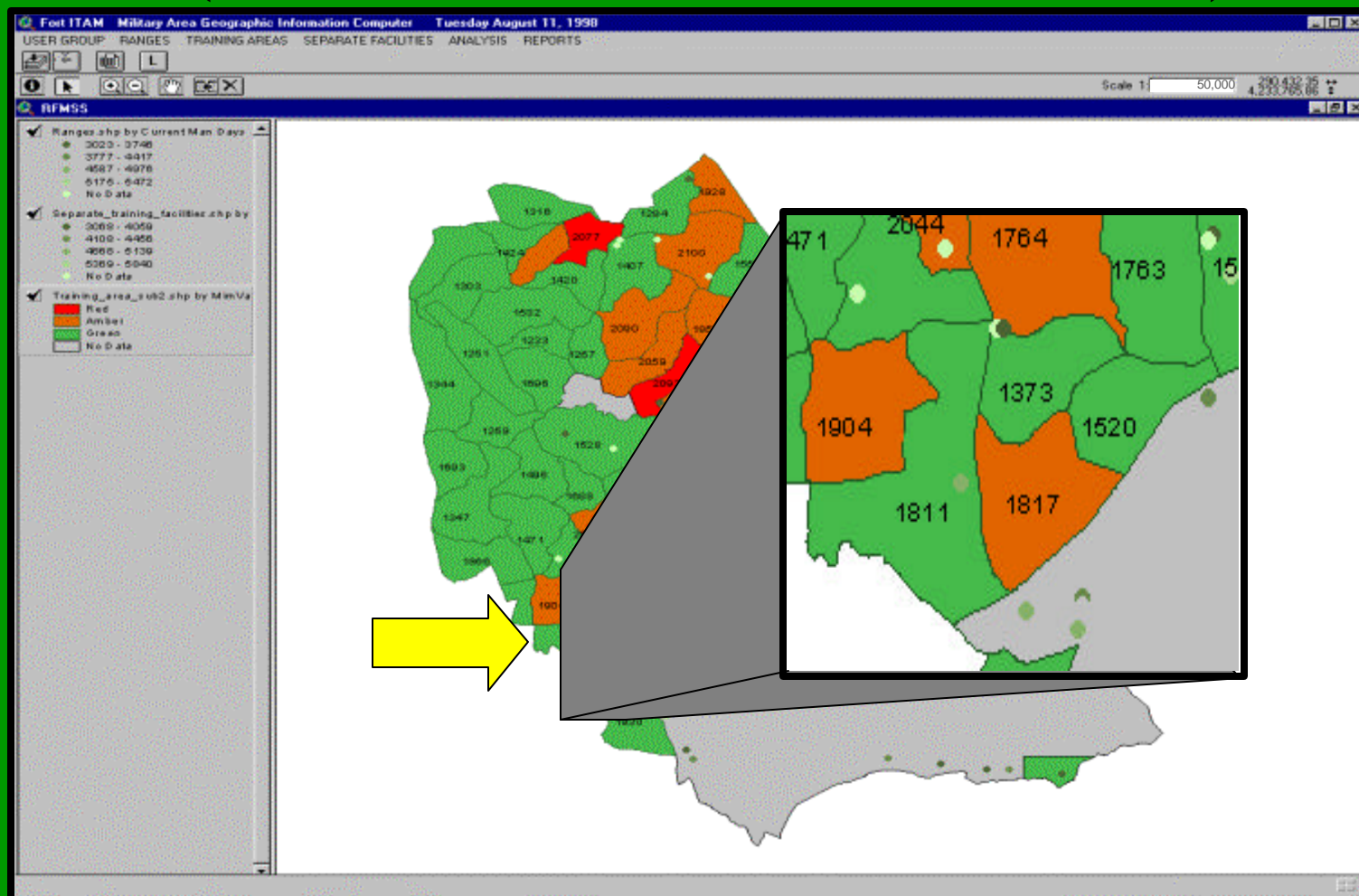
**RFMSS tracks MIMs
(+ 100 MIMs for TA1)**



<i>Tra_area</i>	<i>Redmin</i>	<i>Greenmin</i>	<i>Tgtmin</i>	<i>Cummin</i>	<i>Prjmin</i>
RODES	0	0	0	0	0
SCOUT LN	0	0	0	0	0
TA 21D	0	0	0	0	0
TA1	1850	1750	1800	972	1811
TA10	0	0	0	0	0
TA10A	0	0	0	0	0
TA10B	0	0	0	0	0
TA10C	0	0	0	0	0
TA11	0	0	0	0	0
TA11A	0	0	0	0	0
TA11B	0	0	0	0	0
TA12	0	0	0	0	0
TA12A	0	0	0	0	0
TA12B	0	0	0	0	0
TA12C	0	0	0	0	0
TA13	0	0	0	0	0
TA13A	0	0	0	0	0
TA13B	0	0	0	0	0

GIS Capabilities Scenario

MAGIC MIM status display (current + scheduled + 100 for TA1)



GIS Capabilities Scenario

Day of event 0001 hrs

- **RFMSS commo desk displays color coded status for TA1 (Scheduled, Blue, 229INF)**
- **MAGIC displays (TA1, Blue, Scheduled)**
- **SDZ (worst case 5.56 Ball)**

GIS Capabilities Scenario

**RFMSS commo desk display color coded status
for TA1 (Scheduled, Blue, 229INF)**

FACILITY	UNIT	STATUS	Current Process Date	Current System Date
INF 9	DPW	Req	25/08/1998	25/08/1998
JACKSON	BMU 2	Occ		
LASER TEST	NVESD	Req		
LNGSTRT LZ	1-126AVN	Occ		
LRC	276ENGR	NFT		
LRC	TRNG	Occ		
MED SITE	276ENGR	NFT		
MP BLDG	276ENGR	NFT		
NBC	276ENGR	NFT		
PENDER	1-126AVN	Occ		
PENDER LZ	1-126AVN	Occ		
PT FIELD	276ENGR	NFT		
RG 04	QMOBC	Occ		
RG 04	BMU 2	Occ		
RG 10	NSWGP2	Fir		
RG 27P	276ENGR	Fir		
RG 28P	SLTM 2	Req		
RG 28S	SLTM 2	Req		
RG 32	QMOBC	Fir		
TA1	229 INF	Req		
TA10	1-126AVN	NFT		
TA15	1-126AVN	NFT		
TA16	1-126AVN	NFT		
TA17	NVESD	Occ		
TA19	NVESD	Occ		

Change Training Status

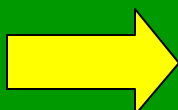
Filter By:

☒ All (Non-Departs)
☐ Scheduled
☐ Training
☐ Firing
☐ Departed

Quick Keys:

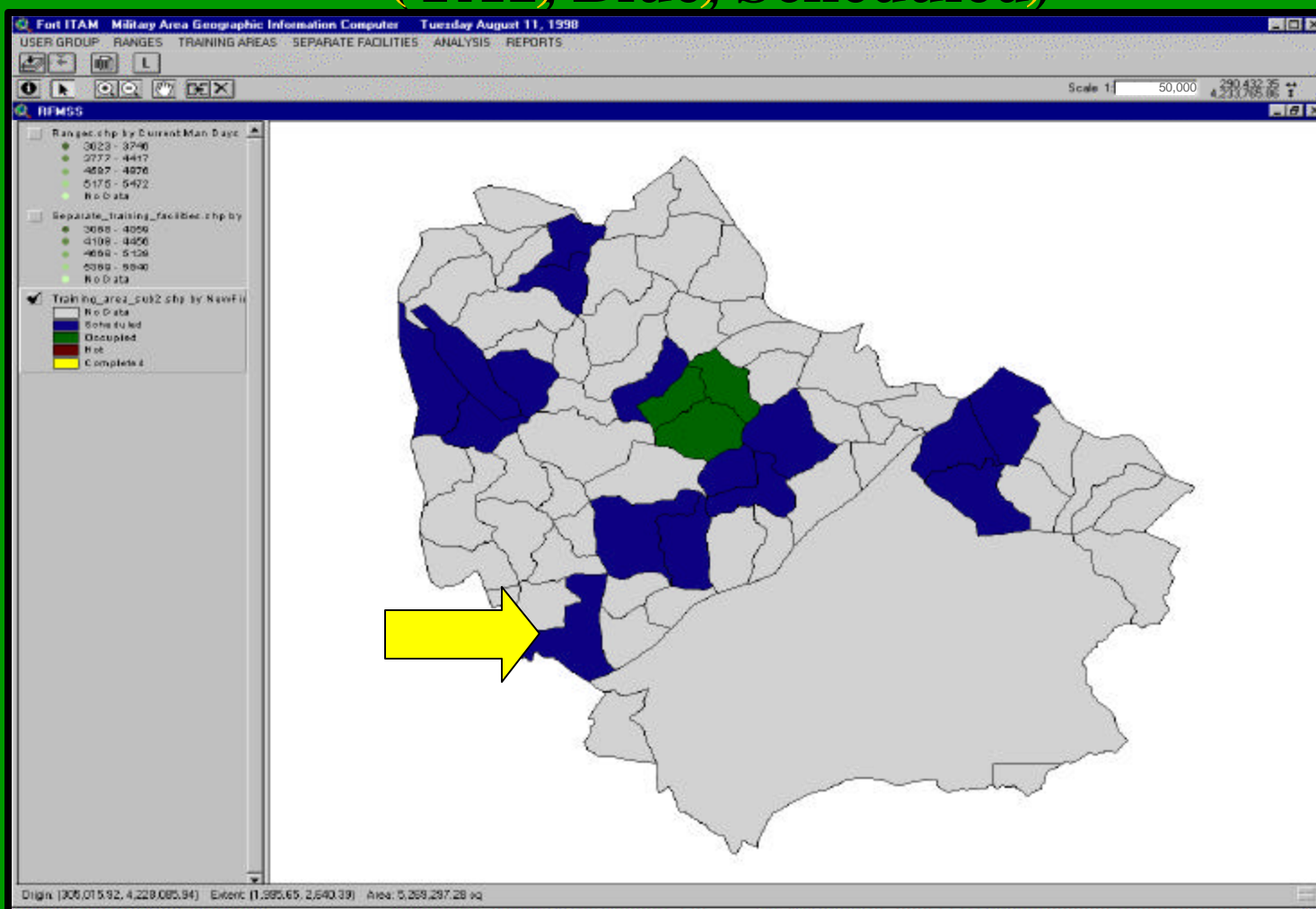
Order By:

☒ Facility
☐ Unit
☐ Status



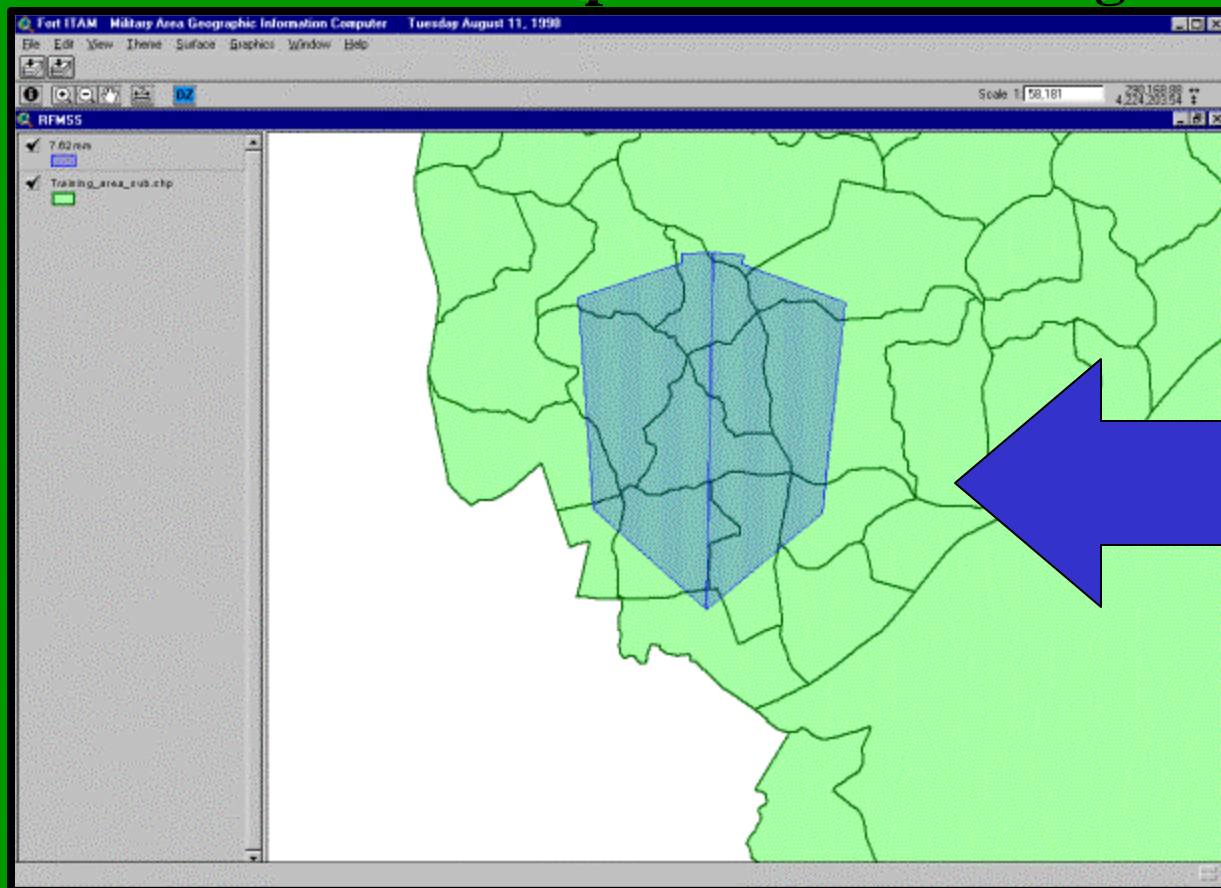
GIS Capabilities Scenario

MAGIC facility status display (TA1, Blue, Scheduled)



GIS Capabilities Scenario

MAGIC's SDZ generator automatically creates worst case scenario for selected calibers, tracks the status of the range and updates the SDZ's color to represent the training status



In this example, the unit training in TA1 has scheduled the training area, but has not yet begun training

GIS Capabilities Scenario

Unit arrives at training area

- **RFMSS commo desk displays color coded status for TA1 (Occupied, Green, 229INF)**
- **MAGIC displays (TA1, Green, Occupied)**
- **MAGIC Unit Locator finds unit**
- **SDZ**

GIS Capabilities Scenario

RFMSS commo desk display color coded status for TA1 (Occupied, Green, 229INF)

FACILITY	UNIT	STATUS
INF 9	DPw	Req
JACKSON	BMU 2	Occ
LASER TEST	NVESD	Req
LNGSTRT LZ	1-126AVN	Occ
LRC	276ENGR	NFT
LRC	TRNG	Occ
MED SITE	276ENGR	NFT
MP BLDG	276ENGR	NFT
NBC	276ENGR	NFT
PENDER	1-126AVN	Occ
PENDER LZ	1-126AVN	Occ
PT FIELD	276ENGR	NFT
RG 04	QMOBC	Occ
RG 04	BMU 2	Occ
RG 10	NSWGP2	Fir
RG 27P	276ENGR	Fir
RG 28P	SLTM 2	Req
RG 28S	SLTM 2	Req
RG 32	QMOBC	Fir
TA1	229 INF	Occ
TA10	1-126AVN	NFT
TA15	1-126AVN	NFT
TA16	1-126AVN	NFT
TA17	NVESD	Occ
TA19	NVESD	Occ

Current Process Date: 25/08/1998 Current System Date: 25/08/1998

Filter By:

☒ All (Non-Departs)

☐ Scheduled

☐ Training

☐ Firing

☐ Departed

Quick Keys:

Order By:

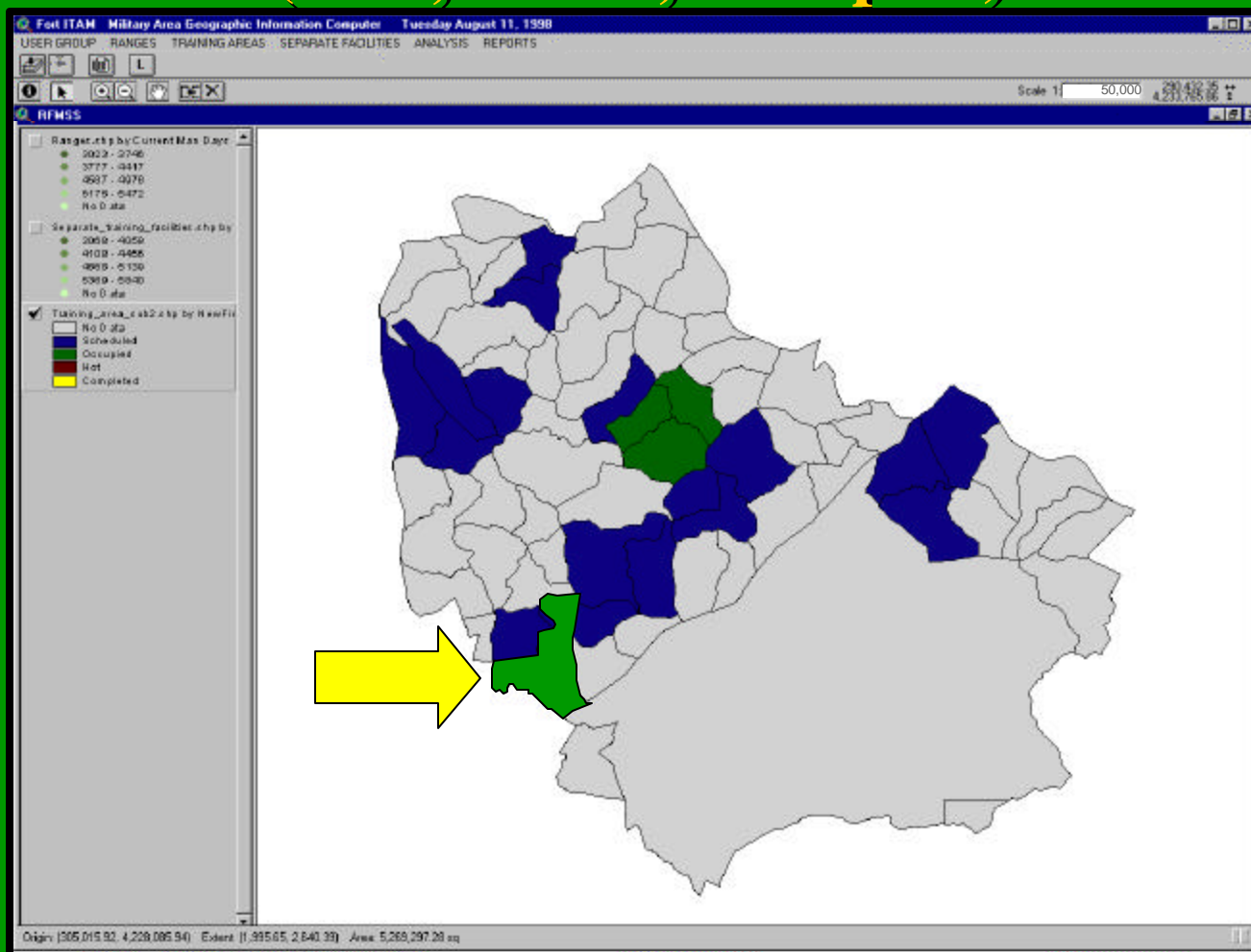
☒ Facility

☐ Unit

☐ Status

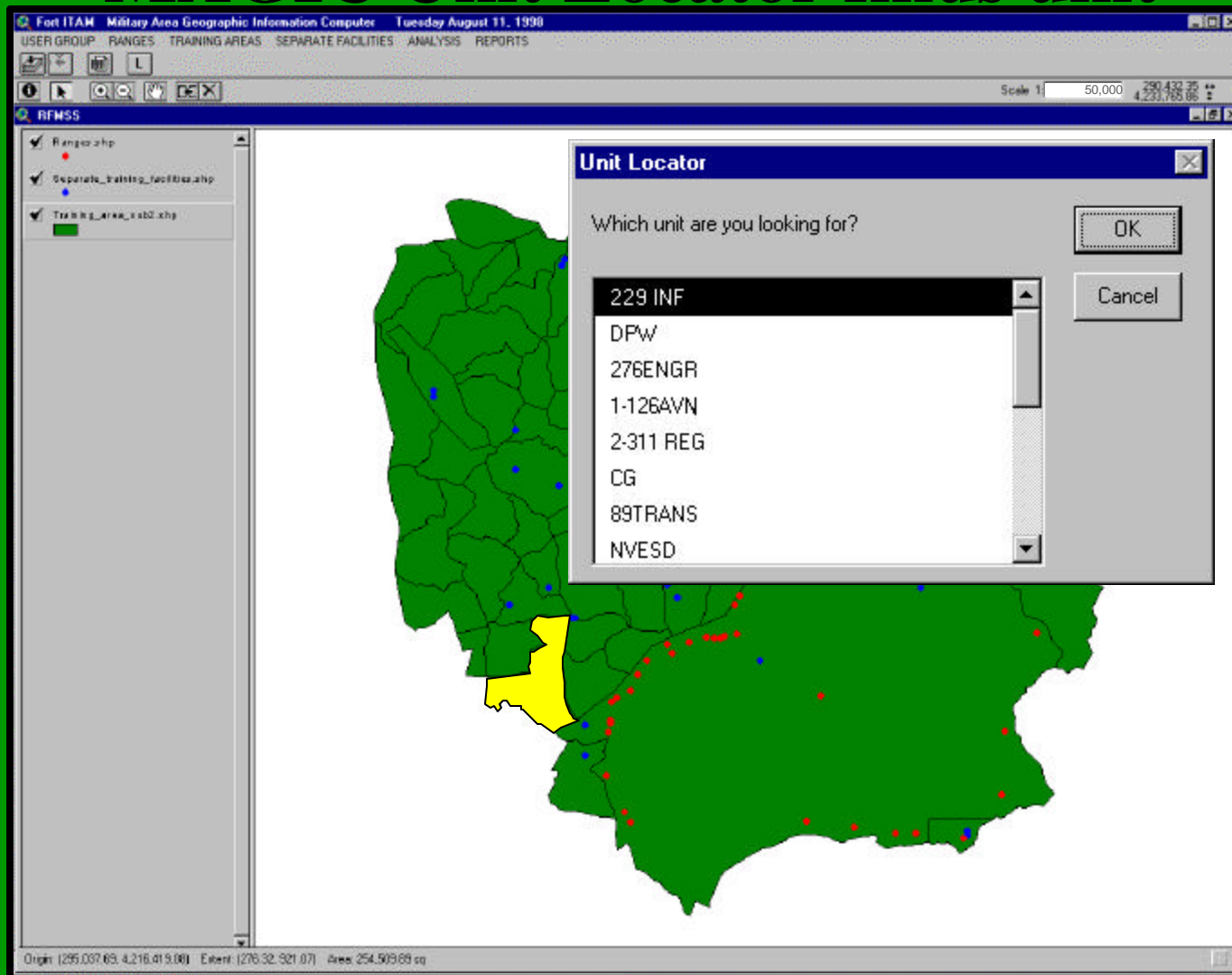
GIS Capabilities Scenario

MAGIC facility status display (TA1, Green, Occupied)



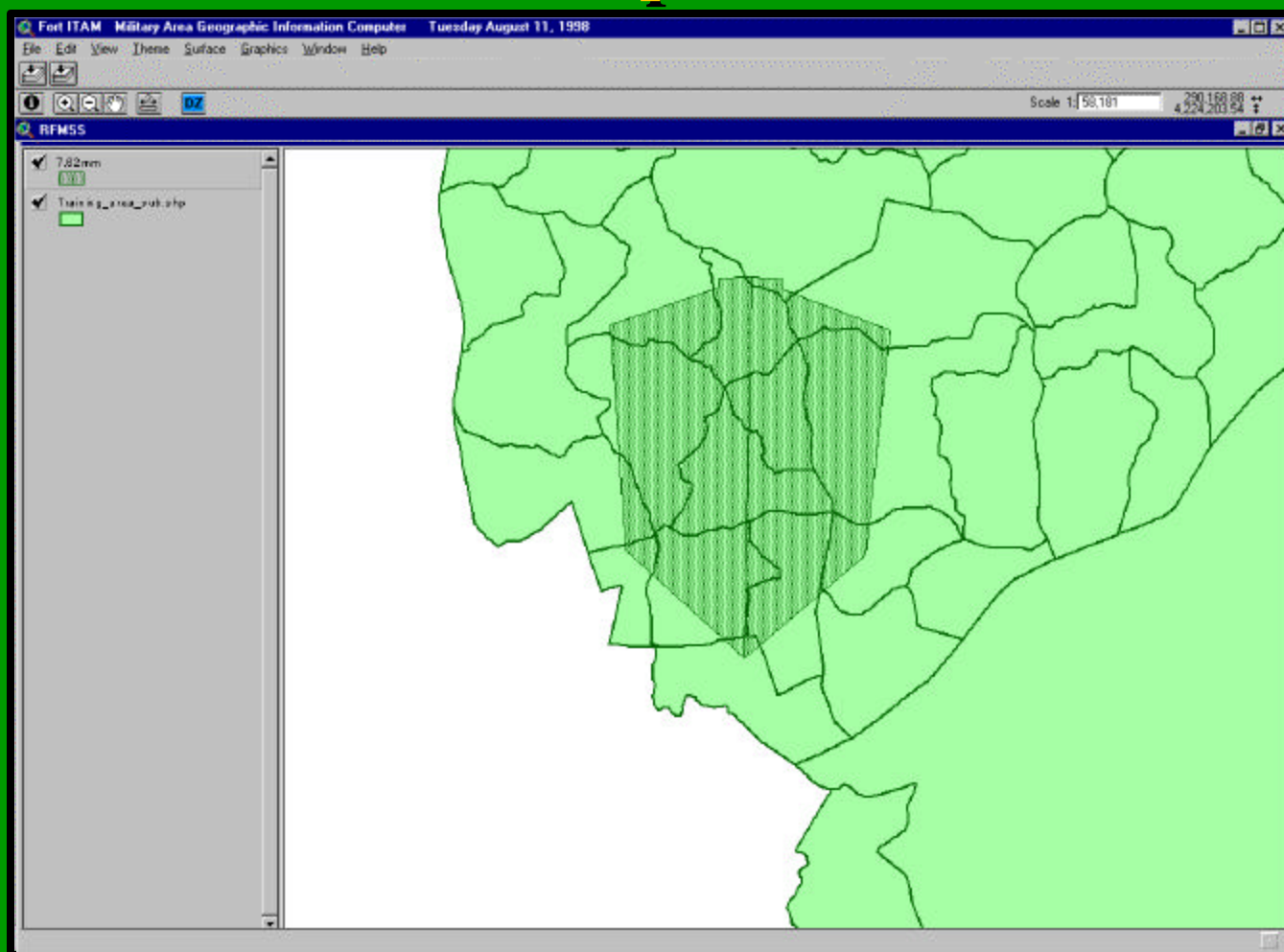
GIS Capabilities Scenario

MAGIC Unit Locator finds unit



GIS Capabilities Scenario

Magic displays green SDZ to signify unit is in occupied status



GIS Capabilities Scenario

Unit begins live fire training

- **RFMSS** commo desk displays color coded status for TA1 (Hot, Red, 229 INF)
- **MAGIC** displays (TA1, Red, Hot)
- **SDZ**

GIS Capabilities Scenario

**RFMSS commo desk display color coded status
for TA1 (Hot, Red, 229INF)**

FACILITY	UNIT	STATUS
INF 9	DPW	Req
JACKSON	BMU 2	Occ
LASER TEST	NVESD	Req
LNGSTRT LZ	1-126AVN	Occ
LRC	276ENGR	NFT
LRC	TRNG	Occ
MED SITE	276ENGR	NFT
MP BLDG	276ENGR	NFT
NBC	276ENGR	NFT
PENDER	1-126AVN	Occ
PENDER LZ	1-126AVN	Occ
PT FIELD	276ENGR	NFT
RG 04	QMOBC	Occ
RG 04	BMU 2	Occ
RG 10	NSWGP2	Fir
RG 27P	276ENGR	Fir
RG 28P	SLTM 2	Req
RG 28S	SLTM 2	Req
RG 32	QMOBC	Fir
TA1	229 INF	Fir
TA10	1-126AVN	NFT
TA15	1-126AVN	NFT
TA16	1-126AVN	NFT
TA17	NVESD	Occ
TA19	NVESD	Occ

Current Process Date: 25/08/1998 Current System Date: 25/08/1998

Change Training Status

Filter By:

☒ All (Non-Departs)
☐ Scheduled
☐ Training
☐ Firing
☐ Departed

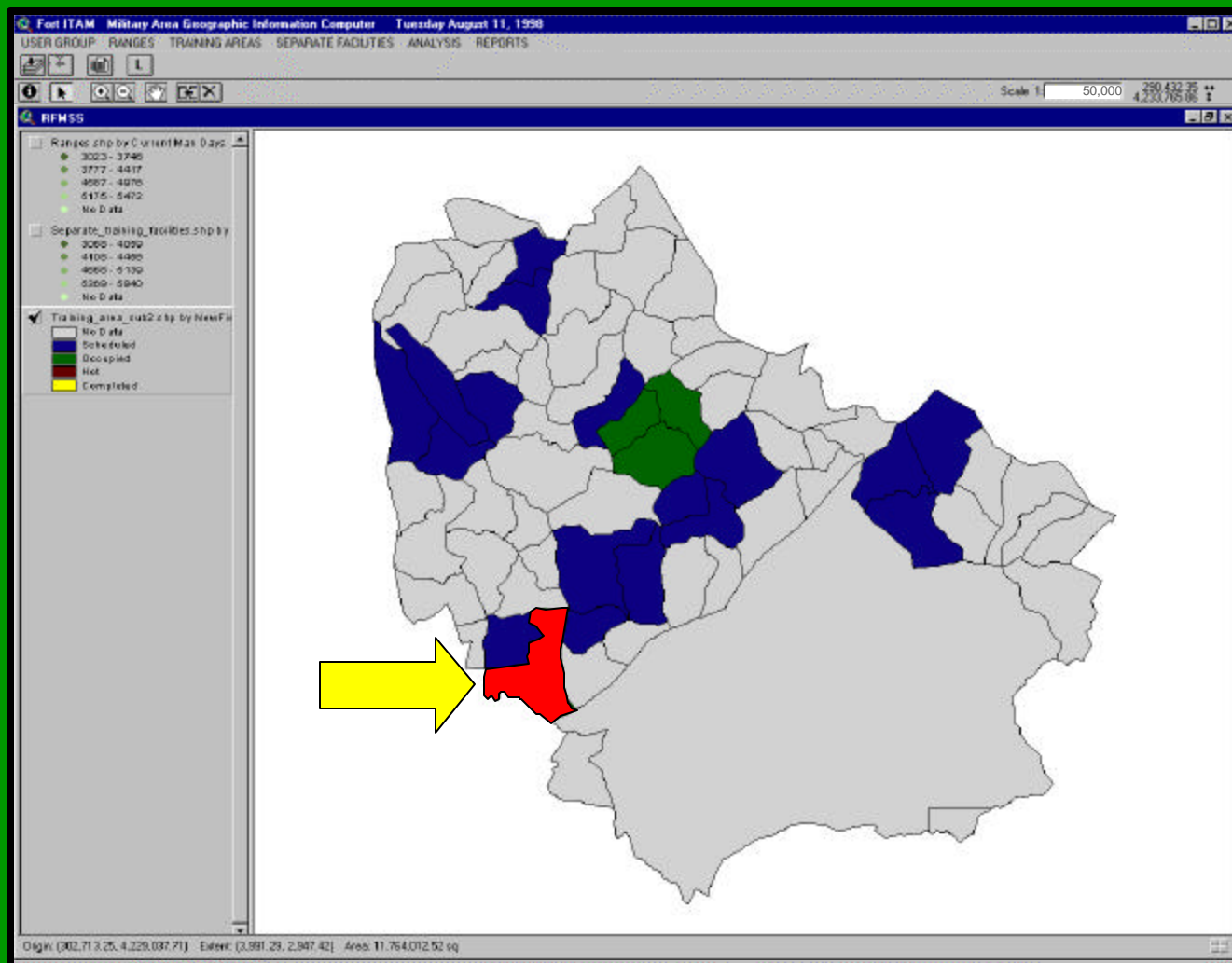
Quick Keys:

Order By:

☒ Facility
☐ Unit
☐ Status

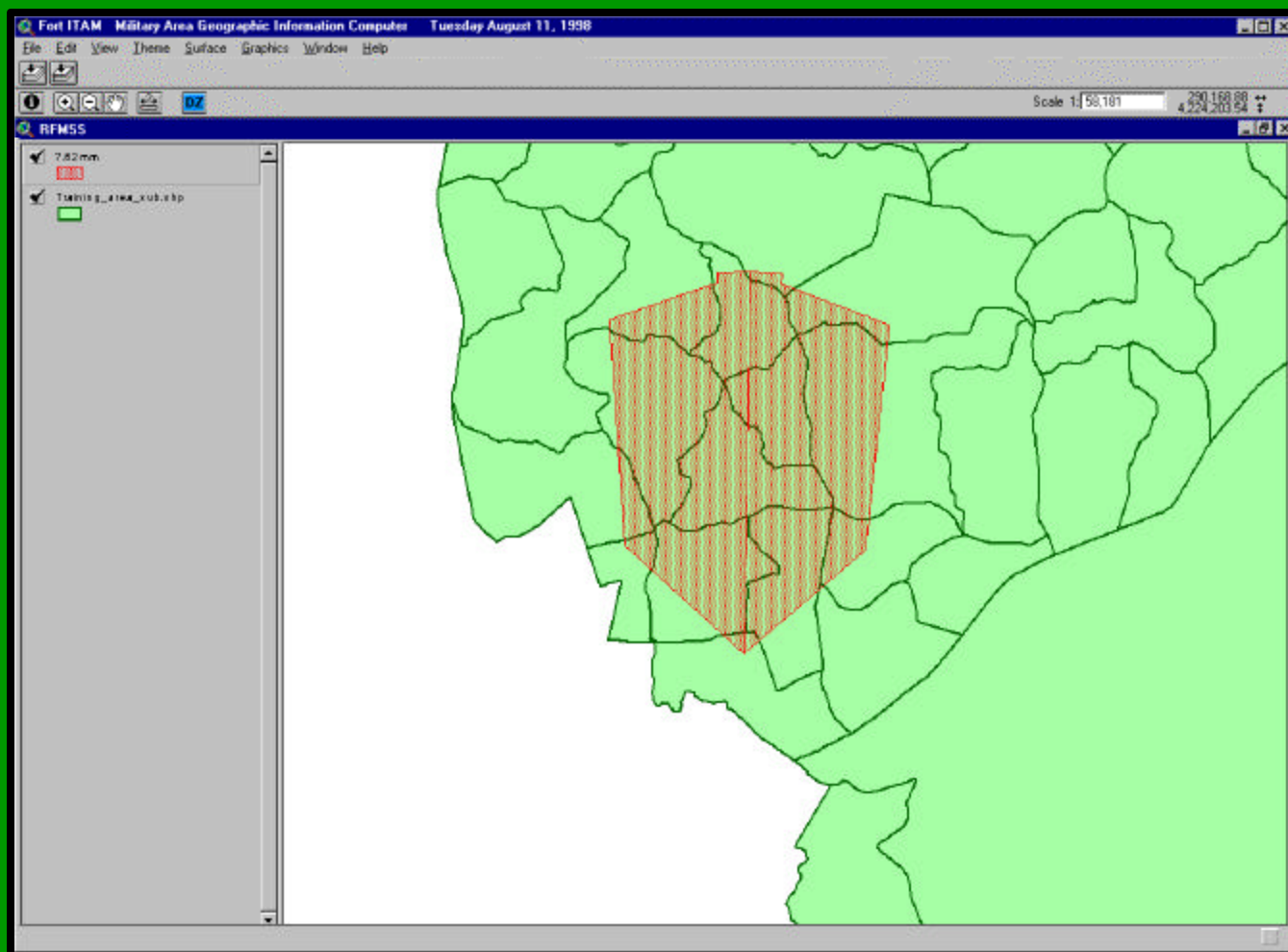
GIS Capabilities Scenario

MAGIC facility status display (TA1, Red, Hot)



GIS Capabilities Scenario

Magic displays red SDZ to signify that the unit is in live fire status



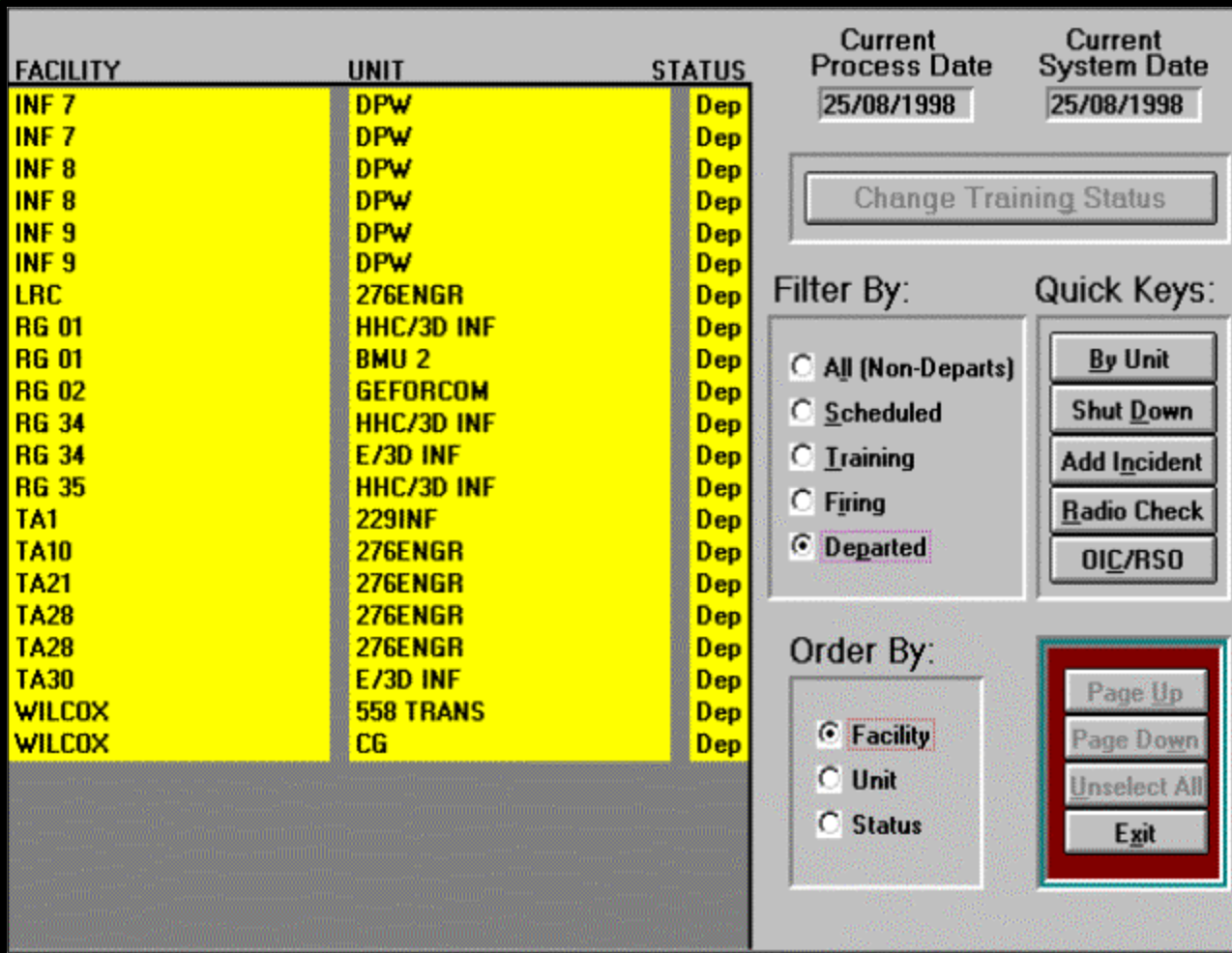
GIS Capabilities Scenario

Unit completes training

- RFMSS commo desk displays color coded status for TA1 (Training Complete, Yellow, 229INF)
- RFMSS recalculates MIMs (previous current +100 for TA1)
- MAGIC displays (TA1, Yellow, Training Completed)
- MAGIC Unit Locator no longer displays location
- RFMSS displays recalculated MIMs (previous current + 100 for TA1 + scheduled)
- Unit reports munitions expended as part of closing report

GIS Capabilities Scenario

RFMSS commo desk display color coded status for TA1 (Training Complete, Yellow, 299INF)



FACILITY	UNIT	STATUS
INF 7	DPW	Dep
INF 7	DPW	Dep
INF 8	DPW	Dep
INF 8	DPW	Dep
INF 9	DPW	Dep
INF 9	DPW	Dep
LRC	276ENGR	Dep
RG 01	HHC/3D INF	Dep
RG 01	BMU 2	Dep
RG 02	GEFORCOM	Dep
RG 34	HHC/3D INF	Dep
RG 34	E/3D INF	Dep
RG 35	HHC/3D INF	Dep
TA1	229INF	Dep
TA10	276ENGR	Dep
TA21	276ENGR	Dep
TA28	276ENGR	Dep
TA28	276ENGR	Dep
TA30	E/3D INF	Dep
WILCOX	558 TRANS	Dep
WILCOX	CG	Dep

Current Process Date: 25/08/1998
Current System Date: 25/08/1998

Change Training Status

Filter By:

- ☐ All (Non-Departs)
- ☐ Scheduled
- ☐ Training
- ☐ Firing
- ☒ Departed

Quick Keys:

- By Unit
- Shut Down
- Add Incident
- Radio Check
- OIC/RSO

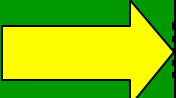
Order By:

- ☒ Facility
- ☐ Unit
- ☐ Status

Page Up
Page Down
Unselect All
Exit

GIS Capabilities Scenario

RFMSS recalculates MIMs (previous current +100 for TA1)



<i>Tra_area</i>	<i>Rednim</i>	<i>Greenim</i>	<i>Tgtmim</i>	<i>Cumim</i>	<i>Frzjnim</i>
RODES	0	0	0	0	0
SCOUT LN	0	0	0	0	0
TA 21D	0	0	0	0	0
TA1	1850	1750	1800	1072	1811
TA10	0	0	0	0	0
TA10A	0	0	0	0	0
TA10B	0	0	0	0	0
TA10C	0	0	0	0	0
TA11	0	0	0	0	0
TA11A	0	0	0	0	0
TA11B	0	0	0	0	0
TA12	0	0	0	0	0
TA12A	0	0	0	0	0
TA12B	0	0	0	0	0
TA12C	0	0	0	0	0
TA13	0	0	0	0	0
TA13A	0	0	0	0	0
TA13B	0	0	0	0	0